

States National Museum where the molluscs were identified by Dr. Paul Bartsch and the crustacea by Dr. H. A. Pilsbry. There were 22 species of molluscs and one crustacean. As far as we know no drills have been planted, but of course there is always the chance that they may have eluded us. However none have yet been found on the new beds.

Japanese species introduced with seed oysters. 3/26/30.

Thais tumulosa clavigera (Küst)
Alectrion lirata (Dkr.) (?*A. festiva* Powis)
Turbo coronatus (Gmel.)
Tegula undatella (Gould) young
Potamides (Batillaria) multiformis (Lischke)
Littorina (Littorivaga) sitchana (Phil.)
Cellana amussitata (Rve.) young
C. toreuma (Rve.) young
Acmaea concinna (Lischke)
A. heroldi (Dkr.)
A. heroldi pygmaea (Dkr.)
Siphonaria cochleariformis (Rve.)
Odostomia (Evalea) species undet.
Septifer rostratus (Dkr.) young
Modiolus atratus (Lischke)
Mytilus dunkeri (Rve.) young
Anomia laqueata (Rve.)
Pecten (Chlamys) irregularis (Sby.) young
Cypricardia lyrata (Rve.)
Paphia (Ruditapes) japonica (Desh.) young
Sunetta excavata (Hanley)
Macoma inquinata (Desh.)
Balanus amphitrite albicostatus (Pilsbry)

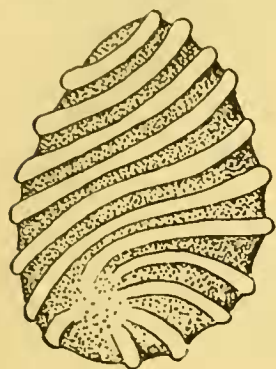
SPIRALLY RIDGED EGGSHELL OF PLEURODONTE, WITH NOTES ON THE RAPID GROWTH OF A LAND SNAIL

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While eggs of snails may be very small the egg capsule or eggshell may be very large as it encloses both the egg and much food material to feed the young before it comes out of the shell. Such eggshells may look like those of reptiles or of birds, and as far as we know they are smooth on the outside. Hence the occur-

rence of snail eggshells with ridges upon them seems worthy of notice.

In Jamaica, B. W. I., large white eggs suggesting those of lizards, but with marked spiral ridges, Figure 1, were found July 28, 1932, under leaves and trash on honeycombed limestone rock, in a small banana patch on the left side of the road coming from Stony Hill toward Kingston.



1 mm.

These eggs were in two separated clutches of twelve to twenty each, each egg being nine by seven millimeters. Such spiral eggs were known to a native boy there who stated the belief that they elongated and became directly the spiral "zebra shell," *Oxystyla undata*, some of which were found there together with several species of *Pleurodonte* and other land snails.

The ridges on the shell were most striking and about six in number, but passing once and nearly a half times about the egg it was possible to see at least ten parallel ridges on some sides of the egg. The ridges arose gradually from a central area near one end of the shell and faded away in a like area near the other end, but these two areas were on the side of the main axis of the shell so that only the one near the larger end of the shell is represented in the figure. These areas of origin and ending suggest a completion of the eggshell after muscular action of a secreting tube, and seem comparable to the big and lesser ends of the shell of the egg of the hen. These eggs floated in water and their shells were thick, not brittle, but pliable, like white kid leather. With the microscope it was evident that the organic matrix of the shell was filled with opaque, white, cuboidal crystals, which dissolved in acetic acid with effervescence and left in the matrix holes of the same shape as the crystals. Taken to Baltimore, Maryland, some of these eggs cracked open and young snails emerged August ninth. Each nearly filled the eggshell. One within the shell measured 7 by $6\frac{1}{2}$ mm. but was only 3 thick as it was flattened somewhat like a planorbis in form, with the upper surface flat and the lower hollowed out by a deep umbilicus. The wide flaring mouth of the shell measured 3 mm.

These young were kept in a nine-liter glass jar together with a dozen or more young slugs, *Veronicella*, and all were fed lettuce, some plantain leaves and raw sweet potato and supplied with limestone and towel paper, but with no earth. On September 3rd there were but four to be found, two dead with diameters of 9 and 7 mm. and two living with diameters of 17 and 7 mm. These little snails then had a reddish tinge with eyes yellow on red stalks, in shells of two and a half whorls and with sharp peripheral edges.

The shells were very thin, horny, and so transparent as to allow the pigment of the mantle to show plainly. Even before hatching there were streaks of black pigment on the middle of the body parallel to the edge of the aperture. By October the 25th, the shells had increased to nearly four whorls and the pigment was scattered in small blotches, a dozen or so to each whorl, so that the animal had a mottled appearance since the pigment showed so readily through the thin shell. The shell was at first so very thin as it grew that when the larger shell had a diameter of 34 mm. a piece of 6 × 11 mm. broke off in handling, but this was rapidly restored. In the smaller snail growth was also by very thin shell and when it was 35 mm. wide, January 11, 6 mm. was broken off, but this was restored by a growth of 5 mm. of excessively thin shell within 20 days.

The rate of growth for both snails was about 10 mm. per month at first, but soon the smaller fell off to about one-third that rate and only in January had it grown to the size attained by the larger in October.

It is to be noted that the young from the same locality differed much in size at the time of hatching and two did not continue to grow at the same rate under conditions apparently alike. In November, the larger snail was already forming its maturity peristome and soon after that did not increase in dimensions. Thus under the above conditions of feeding and confinement this snail may attain to full growth in about four months from August through November. As mature shells they were identified by Dr. Henry A. Pilsbry as *Pleurodonte acuta semperfluens* Pilsbry and Brown, so that the possession of this peculiar spirally ridged eggshell is one of the characters of this species, which may be shared with other species as yet not traced to the egg.

The two survivors did not attain the complete size of adults taken in Jamaica, nor did they quite express all of the normal proportions of shell, for while having sufficient depth they lacked about one-tenth in maximum diameter since the edges of the shell were rounded and not characteristically sharp. It seems that under the abnormal conditions of confinement and restrictions in diet perfect form was not attained.

The following table gives measurements in millimeters and some weights in milligrams of the above two young, *a* and *b*, compared with those of normal adult, *x*, not reared in captivity. While the measurements are not exact, they show that the reared young may, after one season of growth from the egg, be nearly as large and nearly as heavy as some of the wild snails. The recorded losses in weight may have been due to losses in water as well as to errors in measurement.

Date	Maximum Diameter				Maximum Diameter				Thickness		Weight		
1932	m.	d.											
	8	9	7				6½		3				
			<i>a</i>	<i>b</i>							<i>a</i>	<i>b</i>	
	9	3	17	7	9	7							
	9	27	25	22			<i>a</i>	<i>b</i>	11	10			
	10	25	34	29			29	25½	17½	14			
1933	11	29	43½	31½			37	29	23	16			
	12	20	45	32			37	28	23	15	<i>a</i>	<i>b</i>	
	1	11	44	35			37	30	25	19	15000	7600	
	1	31	45	38	<i>x</i>		33	34	<i>x</i>	25	21	<i>x</i>	
	2	25	45	43	50		37	35	47	22	22	21	16700 13700 22370
	3	24	45	43½	50		36½	35	45½	21	22	21½	16500 13250 22280
	6	3	45	43			38	36	23	22			
	8	2									15700	15400	

Dissection of a mature shell of this species shows that the anterior ten millimeters of the thick gonoduct, just before it divides externally into the short oviduct to pass to the exterior and the long deferent duct to pass to the penis sac, is marked by diagonal bands which are light in color and sharply outlined in the specimen preserved in Bouin's fluid. There are nearly a dozen of

these light bands that pass over the top and the sides of this terminal pouch, but there are none externally visible below, as that side is covered by the darker gland of the walls of the deferent duct. Internally oviduct and deferent duct are already separate. The deferent duct lies below and is covered above and on the sides by the white walls of the oviduct enveloping the top of the deferent duct with its thick glands. The diagonal bands are due to folds of the walls of the oviduct which are more than half a millimeter deep above and on the sides but much thinner below. Evidently the deep narrow clefts between the diagonal glandular folds account for the position of the ridges on the outside of the eggshell. The oviduct walls also have muscle fibers which doubtless play a part in forming the eggshell.

THE HABITATS OF IOWA SUCCINEAS

BY B. SHIMEK

The genus *Succinea* is often described as "amphibious." Of the species inhabiting Iowa this is strictly true only of *S. retusa*, though *S. concordialis* inhabits the muddy borders of lakes and streams (never, however, appearing in water), where it may be associated with *retusa*; while *S. avara*, though sometimes occurring with *S. retusa* on low, muddy flats, also extends well up into upland woods in contiguous territory, being our most adaptable species.

The remaining species, *ovalis* and *grosvenorii*, display certain peculiarities of habitat and distribution which are worthy of note.

Succinea ovalis Say is found in more or less scattered areas in all wooded parts of the state. In the eastern part the writer has almost invariably found it in low, alluvial woods, subject to overflow. During flood times the animals creep up on the trunks of trees and the stems of coarse plants which project above the water; but at other times during the open season they may be found creeping about on various plants, to which they may also remain attached during drier parts of the day or season after forming a thin, transparent epiphragm; or they may creep about on the moist ground or hide under logs. During the late fall or winter they hibernate under the fallen leaves of bottomland